

# Development of a Colorado NSDI Transportation Layer

---

Prepared by CDOT GIS Section Staff:

Paul Tessar, Data Management Unit Supervisor

Tammy Goorman, GIS Section Manager

# *The Status Quo*

---

- CDOT annually updates a 152k segment local roads GIS layer/database covering 330 local jurisdictions.
- New roads are table-digitized from plat maps.
- Attributes for new roads and attribute changes for existing roads are key-entered to a tabular database.
- For major roads, there is a link and a one-to-one relationship between Arcs and database rows.
- For local roads, there is no link and segmentation differs between the Arcs and database rows.

# *The Vision*

---

- CDOT and many Colorado local jurisdictions jointly maintain a single, shared GIS layer for local roads.
- Local agencies update the GIS layer and attributes as part of their normal business processes. All road arcs will be linked to database rows and be 1-to-1.
- CDOT periodically receive updates from local agencies and completes statewide tasks:
  - Area integration functions;
  - Producer of last resort for non-participating jurisdictions;
  - Inter-jurisdictional reconciliation; and,
  - Statewide data development efforts.

# *CDOT's mandate on local roads*

---

- Local Road Mileage Certification Program:
  - Mileage used to allocate of Gas Tax \$ (HUTF).
  - \$250M/year used by local govts. to maintain roads.
  - Requires annual update of DB and GIS layers.
- Transportation Planning:
  - Covers Highways and major local roads on the National Highway Planning Network.
  - Requires current GIS and road characteristic data.

# *Local Government Responsibilities*

---

- Review existing roads inventory & GIS data
- Provide information on system changes:
  - Jurisdiction changes (e.g. Annexations)
  - Condition changes (e.g. Good to Fair)
  - Characteristic changes (e.g. widened, resurfaced)
  - New facilities and abandonments
- Certify system as of 12/31 of each year.

# *“Traditional” Methods*

---

- CDOT sends maps and database listings to 330 Towns, Cities and Counties in Colo.
- Local govts. handwrite on listings, fill out forms, sketch on maps & send plats to CDOT.
- CDOT staff key-enter updates to database and table-digitize new roads into GIS layers.
- CDOT reports certified public road mileages to the Treasurer and FHWA for \$ allocation.
- CDOT distributes GIS products via Internet.

# *Digital Methods*

---

- Database only
- GIS data layer update alternatives:
  - Two separate GIS Databases Maintained; or,
  - Integrated/shared State/local DB and GIS.

# *Digital methods used for tabular inventory in 2002 update cycle*

---

- CDOT developed a VBA for Access application to allow local agencies to update their attribute data: AHUT – the Access Highway User Tax editor.
- Of 183 jurisdictions with changes, 50, including most of the larger ones, used AHUT to report them.
- Reported changes were successfully posted to the master database.
- Some problems with back end processing...



# *DB Columns of local interest*

## **Keys/Spatial**

*FIPSCity*

route

segmID

FIPSCounty

*urbanID*

*NAAQSID*

*GISID*

*HPMSID*

## **Description**

segmPrefix

routeName

fromFeature

segmDir

toFeature

## **Attributes**

priSurf

priSurfWd

thruLnQty

operation

length

priPSI

adminClass

jurSplit

builtYr

projYr

updateYr

## **Attributes**

*rrxID*

*strID*

*AADT*

*AADTYr*

*AADTDeriv*

*funcClassID*

*trkRestrict*

*access*

*forestRoute*

*NHSDesig*

*priIRI*

*Italicized attributes cannot be edited by local agencies*

# *Benefits of using digital methods for tabular inventory updates*

---

- Elimination of handwriting changes on inventory printouts and filling out system change reports.
- Reduction of data entry errors.
- Enhanced control of database contents.
- Ability to get mileage totals or new inventory report immediately upon completion of annual update.
- Availability of the database for maintenance over the year.
- Easier to synchronize segmentation with local GIS or tabular databases so that they can be linked.
- Asset inventory as a starting point for GASB 34.

# *Digital methods in use for GIS data layer updates*

---

## *Two separate GIS Databases Maintained*

- Local govt. provides GIS or CAD data in known datum, projection and coordinate system. ***VERY IMPORTANT!***
- CDOT snaps our GIS roads/cities layers to local digital data and copies any new features to CDOT layers.
- Thereafter, GIS or CAD update files are sent in annually.
- CDOT would like to use all available digital centerline and/or city limits data for the annual update!
- 12 Counties and 28 Cities have provided CDOT with their GIS or CAD centerlines and/or boundaries to date

# *Benefits of using digital methods for GIS data layer updates*

---

- No need to find/copy/send plats.
- No need to draw new roads/boundaries on map.
- Improved accuracy.
- Opportunity for Roads/Public Works staff to enhance coordination with local GIS group.

# *Digital methods in development for GIS Data Layer updates*

---

## *Integrated/shared State/local DB and GIS*

- Many variations are possible, depending on:
  - local data availability,
  - system compatibility,
  - local capabilities, etc.
- Completed Projects: Broomfield, Lone Tree & Weld
- In progress: Breckenridge and Otero Co.
- In discussion: Rifle, Garfield Co., Montrose City & County, Montezuma Co., Denver, Greeley.

# *Broomfield Pilot Project*

---

- CDOT road layer was registered to city CAD dataset, and links were added to arcs.
- One row to many arcs relationship was dissolved to create one-to-one.
- Broomfield is maintaining the GIS layer and used AHUT for DB update.

# *Lone Tree Pilot Project*

---

- Local centerline layer was linked to AHUT table, and sent to CDOT.
- Result was one-to-many (not dissolved).
- Lone Tree is maintaining the GIS layer and used AHUT for DB update.

# *Weld Co. Pilot Project*

---

- County staff assembled a road layer from various sources (incl. CDOT).
- AHUT was used for their attrib. upd.
- Segments on AHUT inventory and GIS layer were synchronized by county staff.
- Result was a one-to-one relationship.
- County will maintain GIS layer and will use AHUT for future DB updates.



# *Breckenridge Pilot Project*

---

- City area of County road layer is being linked to DB table by City staff.
- Segments on AHUT inventory and GIS layer are being synchronized by City staff.
- Result will be one-to-one relationship.
- City will maintain GIS layer and will use AHUT for DB update.

# *Otero Co. Pilot Project*

---

- New GIS Program in county will initially use CDOT GIS layers and AHUT DB.
- Segmentation on GIS layer and DB will be synchronized by county staff.
- Over time, GIS layer will be improved using GPS data, etc.
- Otero Co. will maintain GIS layers and will use AHUT for DB update.

## *Benefits of developing an Integrated State/Local DB and GIS*

---

- Most HUTF reporting requirements can be met as byproducts of ongoing local activities. (e.g., PMS, centerline layer)
- Improved accuracy of HUTF information.
- Reduced workloads for both local agencies and CDOT.
- Availability of CDOT website for distribution of local GIS data.

# *Proposed Roles as per the NSDI - National Spatial Data Infrastructure*

---

- Local Governments:
  - “Data producer” and “Custodian”.
  - “Data distributor” via whatever method, if desired.
- CDOT:
  - “Area integrator”, collating and homogenizing local layers into a seamless, statewide coverage.
  - “Producer of last resort” where no local producer.
  - “Data distributor” via the CDOT web site.

## *The Next Logical Step...*

---

- CDOT plans to form a Colorado Local Roads Data Committee to organize efforts.
- Potential roles for CoLRDC:
  - Standards development for local road data content, structure and coding.
  - Design of mechanisms to facilitate data exchange and shared data maintenance.
  - Provision of technical assistance to members in data development & maintenance.
  - Work with organizations like County Assoc., Municipal League, GIS Colorado, etc

## *Benefits of a local roads data committee*

---

- Support an NSDI “Framework data layer” for Colo. and make data available for Homeland Security.
- Increased efficiency at all levels of government.
- Reduced costs at all levels of government.
- Use of a common, consistent DB across jurisdictions.
- Improved accuracy/data quality.
- Improved service to other agencies and the public.

# *Summary*

---

- CDOT has successfully run a centralized program for 20 years (Since Arc 3.0!)
- Higher accuracy local data is becoming increasingly available.
- Pilot projects have proven that CDOT and locals can maintain a shared GIS layer.
- We are ready to “scale it up”!

# *Contact Information*

---

- Paul Tessar (303)757-9805  
[paul.tessar@dot.state.co.us](mailto:paul.tessar@dot.state.co.us)